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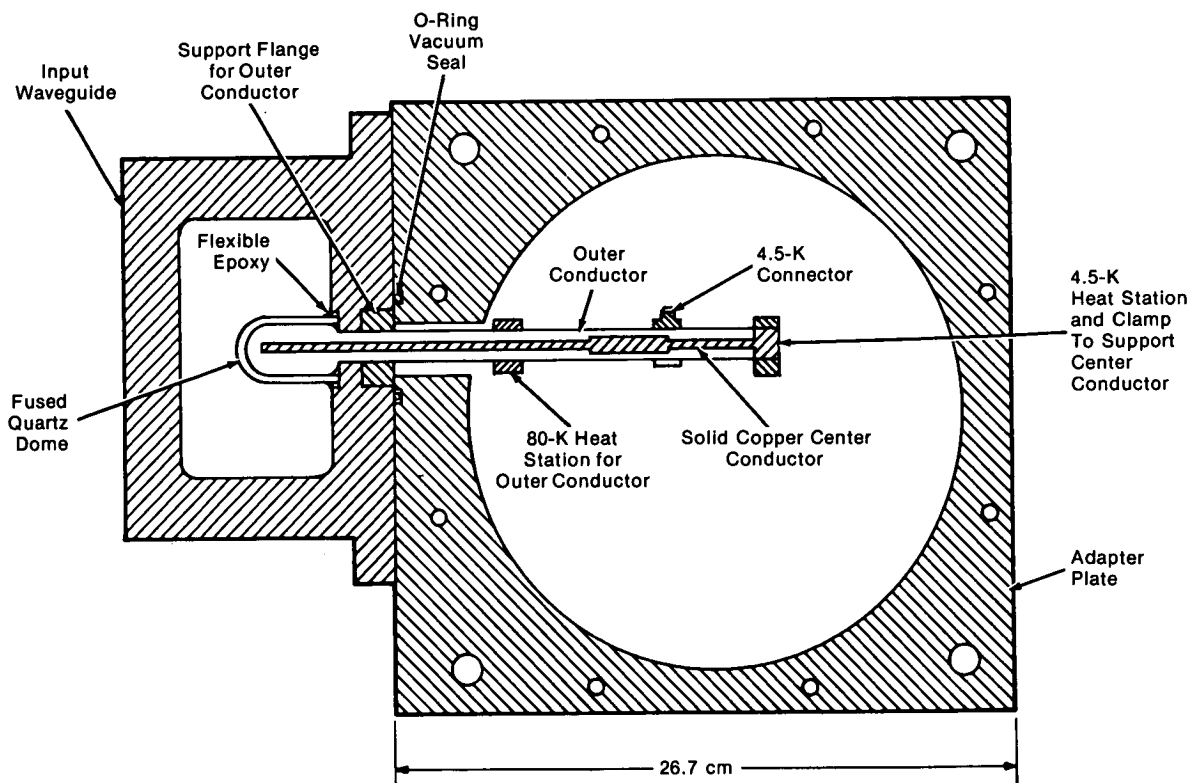
Transmission Line for S-Band Masers

A new shortened transmission line has been developed for S-band masers. The result is reduced noise temperature at the maser input.

The transmission-line assembly is shown in the illustration. The line is coaxial. Its outer conductor is made of a thin-wall (0.25-mm wall) stainless-steel tube; the inside is plated with 0.0025 mm copper and 0.0003 mm gold. This combination gives little microwave loss and adequate thermal isolation. The transmission line is mechanically supported by clamping a flange at the room-temperature end of the

outer conductor, between the adapter plate and the waveguide. Thermal connections to the 80-K and 4.5-K, closed-cycle, helium-refrigeration (CCR) stations are made with flexible copper straps.

The transmission-line center conductor contacts the outer conductor at the 4.5-K temperature connector and at the support clamp (which is thermally connected to the 4.5-K CCR station). It is made of gold-plated, polished copper. A vacuum, common to the CCR vacuum jacket, provides thermal insulation between the coaxial-line center conductor and its surrounding outer conductor and the quartz dome.



Input Transmission-Line Assembly

A fused quartz dome serves as part of the vacuum seal. The quartz dome is attached and sealed to the input waveguide with flexible epoxy. An O-ring seal is used between the waveguide and the adapter plate. The waveguide and fused quartz dome assembly can be replaced without disturbing other input-line components.

Refrigeration capacity measurements show that the total heat transferred to the 4.5-K CCR station (by radiation to the center conductor and by conduction through the outer conductor) is approximately 100 mW. The VSWR (voltage standing-wave ratio) of the transmission-line and waveguide assembly is less than 1.15 to 1 for frequencies from 2,050 to 2,650 MHz. The overall system operating temperature is 8.3 K.

Notes:

1. A 2.1-K maser equivalent-input noise temperature was achieved through the use of the new input transmission line. At Goldstone, California, and at Canberra, Australia, 2.1-K masers were installed on 64-m antennas. The improved systems (each with an overall system temperature of 13 K with the antenna at zenith) enabled the reception of high data-rate television pictures from Mercury (by Mariner spacecraft) in 1974.

2. Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: TSP75-10126

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

Patent Counsel
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103

Source: Robert C. Clauss and Ervin R. Wiebe of
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